



URBAN HIGH SCHOOLERS AS CITIZEN SCIENTISTS: A COLLABORATIVE PARTNERSHIP WITH UNIVERSITY NATURAL RESOURCE EDUCATORS



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Introduction

- University undergraduate natural resource degree programs in the U.S. are at risk (Nyland, 2008; Sharick & Frisk, 2008)
 - ▣ Dwindling enrollment numbers
 - ▣ Limited student diversity
- Urban high school student knowledge and interest in natural resource careers is low (Hager et al., 2007)



Introduction

- High school curriculum limitations...
 - ▣ Interaction with natural resource professionals
 - ▣ Exposure to outdoor, natural resource-related experiences tied to performance standards
 - ▣ Travel funds for field excursions
 - ▣ Teacher self-efficacy with natural resource topics



The *EscapE* Program

- Environmental stewardship and career awareness
program for Education
 - Funded by Environmental Protection Agency and National Fish & Wildlife Foundation
 - Created a partnership between urban high school students, their teachers, university professors, and national wildlife refuge personnel



The *EscapE* Program

- **Goal:** To increase urban student knowledge of natural resource careers by providing opportunities to work with natural resource professionals at Mason Neck National Wildlife Refuge (20 mi. outside of Wash. DC)
- Refuge personnel expressed need for data on...
 - Vegetative composition of refuge forests
 - Past land-use practices at the refuge



The *EscapE* Program

- Authentic (real-world) learning for students
 - A day in the life of a natural resource professional
 - A point of contact for questions and advice
 - A team-oriented project involving data collection, analysis, and interpretation
 - Tree species composition and size
 - Tree rings (dendrochronology)
 - Soils



Student Scientists: Pre-trip

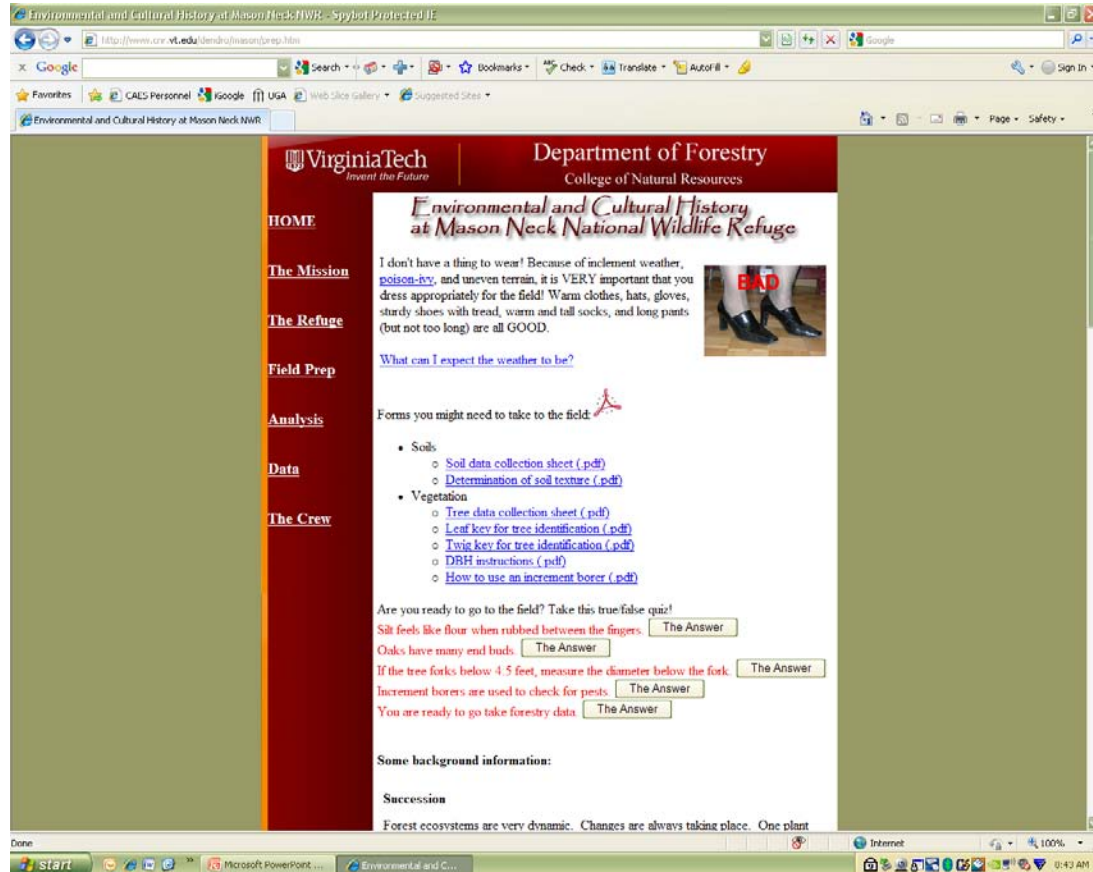
- Teacher training
 - ▣ Meet and greet with refuge personnel and faculty
 - ▣ Site visit (locate established plots)
 - ▣ Equipment use
 - ▣ Website



Student Scientists: Pre-trip



Student Scientists: Pre-trip



Student Scientists: Pre-trip

Environmental and Cultural History at Mason Neck NWR - Spybot Protected IE

http://www.cnr.vt.edu/dendro/mason/prep.htm

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Environmental and Cultural History at Mason Neck NWR

Soils

For general information on soils, visit the [Soil Science Education Home Page](#).

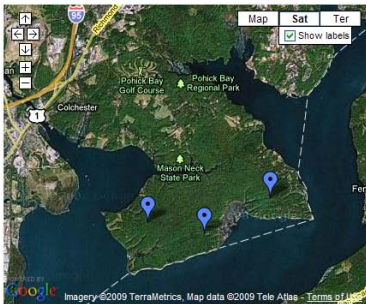
You will be visiting and sampling soils of the [Mattapee](#) series, except for Veg plots 18 and 19, which are on the very similar [Matapeake](#) series.

Soils at the refuge have been heavily impacted by human activity. While there, you will have opportunity to sample one of three soils. One area was a woodlot, and was (we think) not farmed. One area was farmland that was somewhat recently abandoned... guess what is growing there now. The third area has not been farmed for a very long time. How might these cultural practices influence the soil? Which site do you think is the most eroded?

While at the Refuge, you will be augering the soil to reconstruct a soil profile. Do you expect large color changes between soil horizons?

Historical Ecology

Mason Neck has been inhabited for a very long time, first by the [Dome Tribe](#), later by the family of [George Mason](#). Throughout the 1700's, 1800's and early 1900's, the land was farmed and harvested for pine and hardwood timber. The 1960's brought the threat of subdivision and development to the peninsula. Citizen groups achieved the establishment of the Wildlife Refuge in 1969.



View Larger Map

start

Microsoft PowerPoint ...

Environmental and C...

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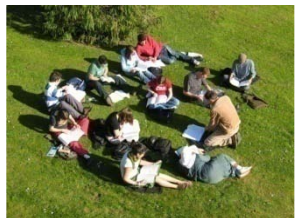
Student Scientists: At the refuge

□ Measuring the plots for sampling



Student Scientists: At the refuge

- Data collection
 - ▣ Tree species and size
 - ▣ Tree rings
 - ▣ Soils



Student Scientists: Post-trip data entry

Environmental and Cultural History at Mason Neck NWR - Spybot Protected IE

https://www.cnr.vt.edu/teaching/mason/analysis.htm

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CAES Personnel Google USA Web Slice Gallery Suggested Sites

Environmental and Cultural History at Mason Neck NWR

Basal Area: Foresters often use the term "basal area" to talk about how much wood is on a forested site. If you tell Ranger Nick that your site has 14 square meters of basal area per hectare, he would look at you funny. However, if you do the quick math in your head (multiply by 4 305564) and tell Nick you have 60 square feet per acre, he would picture a very sparse site with few trees. If you tell him you have 220 square feet per acre (51 square meters per hectare), he would picture a dark and dense stand.

Basal area is not tough to picture. Imagine cutting down every tree on one acre of ground at DBH (4.5 feet above the ground). Then imagine you hover above the stumps in a balloon. The total area in wood that you can see when looking down is the basal area. Commonly, only about 0.3% of the ground area is actually occupied by trees (120 square feet / 43560 square feet in an acre)... or in SI units, 30 square meters per 10,000 square meters in a hectare. Shocking!



If all the trees on this log truck came from one acre, the total area of their ends would be the basal area per acre. How high would the stumps have to be for this to be true?

The Answer

If you know your sampled tree diameters, you can calculate basal area. This is more math... don't panic. For each tree in your sample, figure out the area of wood at DBH (area of a circle = $\pi \times \text{radius}^2$). Sum all of your areas to get total basal area per plot. If you sampled a 1/20 acre plot, multiply by 20 to get total basal area per acre.

Making a Scientific Poster: A scientific poster is a common method of presenting experimental results. A poster is very different from a scientific paper.

Done

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Student Scientists: Post-trip data entry

Environmental and Cultural History at Mason Neck NWR - Spybot Protected IE

http://www.cnr.vt.edu/forestry/mason/data.htm

Google

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Environmental and Cultural History at Mason Neck NWR

VirginiaTech
Invent the Future

Department of Forestry
College of Natural Resources

*Environmental and Cultural History
at Mason Neck National Wildlife Refuge*

HOME

The Mission

The Refuge

Field Prep

Analysis

Data

The Crew

What is the USDA Species code? You can find this 4-6 character code in your twig or leaf key, or you can find them [here](#).

Why do I have to enter my data? As part of your [mission](#), you will help the Refuge collect many years of data so future researchers can examine long-term forest trends.

Click "Submit" at the bottom after you have entered ALL your data.

Date:

Plot Number:

School:

Teacher:

Stand Age (tree core)

Soil Data:

Horizon	Depth (cm.tenths)	Color	Texture
Example	10.6	7.5R7/2	sandy clay
O	<input type="text"/>	<input type="text"/>	<input type="text"/>
A	<input type="text"/>	<input type="text"/>	<input type="text"/>
B	<input type="text"/>	<input type="text"/>	<input type="text"/>

Tree Data:

Tree Number	USDA Species Code	Diameter (cm.tenths)
1	<input type="text"/>	<input type="text"/>
2	<input type="text"/>	<input type="text"/>
3	<input type="text"/>	<input type="text"/>
4	<input type="text"/>	<input type="text"/>
-	<input type="text"/>	<input type="text"/>

Done

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Student Impact: Data Collection

- Online questionnaire (post-then-pre design)
 - ▣ Life skill development
 - ▣ Science career knowledge
- “Pen pals” with university faculty
 1. Faculty emailed questions
 2. Student teams responded
 3. Faculty offered feedback and follow-up questions



Student Impact: Findings

Construct (5 items/construct)	Internal Consistency (α)	Significant Change?
Problem-solving skills	0.89	No ($p = 0.45$)
Self-efficacy skills	0.91	Yes ($p = 0.04$)
Team work skills	0.92	No ($p = 0.43$)
Communication skills	0.89	Yes ($p = 0.007$)

n = 54 students

Science career knowledge (5 items, $\alpha = 0.87$): Moderately to highly influenced



Student Impact: Findings

- Domain (theme) analysis of student pen pal responses

Question	Dominant Domain
What surprised you the most?	“Tree species diversity”
How did things go in your plot?	“Surprised by leadership”
Recommendations for refuge?	“Double check measurements”



Recommendations

- ❑ “The teacher training was invaluable!”
- ❑ Be on-site and available to teachers
- ❑ Develop an answer key within plots (trees tagged)
- ❑ Provide pre-trip, on-site, and post-trip instructions
- ❑ Fall data collection is ideal
(given testing schedule)



The Student Scientists

